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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C. 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 26 November 1999 (26.11.99)	
International application No. PCT/FI99/00269	Applicant's or agent's file reference 47563
International filing date (day/month/year) 31 March 1999 (31.03.99)	Priority date (day/month/year) 31 March 1998 (31.03.98)
Applicant AHMAVAARA, Kalle et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
27 October 1999 (27.10.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Céline Faust

Telephone No.: (41-22) 338.83.38

TENT COOPERATION TRE Y

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Date of mailing (day/month/year) 26 November 1999 (26.11.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 47563	
International application No. PCT/FI99/00269	International filing date (day/month/year) 31 March 1999 (31.03.99)

1. The following indications appeared on record concerning:	
<input checked="" type="checkbox"/> the applicant	<input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative
Name and Address NOKIA TELECOMMUNICATIONS OY P.O. Box 300 FIN-00045 Nokia Group Finland	State of Nationality FI
	State of Residence FI
	Telephone No.
	Facsimile No.
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:	
<input type="checkbox"/> the person	<input checked="" type="checkbox"/> the name <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address NOKIA NETWORKS OY P.O. Box 300 FIN-00045 Nokia Group Finland	State of Nationality FI
	State of Residence FI
	Telephone No.
	Facsimile No.
3. Further observations, if necessary:	
4. A copy of this notification has been sent to:	
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Céline Faust Telephone No.: (41-22) 338.83.38
---	--

Patent Office

PATENTTI- JA REKISTERIHALLITUS

Patentti- ja innovaatiolinja

Patent & Innovation

Search Report

TUTKIMUSRAPORTTI

PATENTTIHAKEMUS NRO <i>Appln. No.</i> 980735	LUOKITUS <i>Classification</i> H04B7/005, H04Q7/22	By Express Mail No. EL489905788US
--	---	--------------------------------------

TUTKITTU AINEISTO <i>Research material</i>	
Patenttijulkaisukokoelma (FI, SE, NO, DK, DE, CH, EP, WO, GB, US), tutkitut luokat <i>researched</i> <i>published patent specification</i> H04B7/26, H04Q7/22, H04J3/14, H04J4/00, H04B7/212, H04B7/005 <i>claims</i>	
Tiedonhaut ja muu aineisto <i>Data search and other material</i> EPOQUE tietokannat EPODOC, WPI, PAJ, fulltext tietokannat englisht, germant, frencht	

VIITEJULKAISUT <i>Reference publications</i>		
Kategoria*) <i>Category</i>	Julkaisun tunnistetiedot <i>Identification data</i>	Koskee vaatimuksia <i>relevant</i> <i>to claims</i>
A	US-A-5757772, H04J3/14, Telefonaktiebolaget LM Ericsson	9,10
Y	WO-A-9711568, H04Q7/22, Telefonaktiebolaget LM Ericsson	1,2,5,6,9,10
Y	WO-A-9716040, H04Q7/22, Telefonaktiebolaget LM Ericsson	1,2,5,6,9,10
<p>*) X Patentoitavuuden kannalta merkittävä julkaisu yksinään tarkasteltuna Y Patentoitavuuden kannalta merkittävä julkaisu, kun otetaan huomioon tämä ja yksi tai useampi samaan kategoriaan kuuluva julkaisu A Yleistä tekniikan tasoa edustava julkaisu, ei kuitenkaan patentoitavuuden este</p> <p><i>A) Technological background not a novelty bar</i> <i>Y) Particularly relevant if combined with another doc.</i></p>		
Päiväys Date 16.3.1999	Tutkija Examiner Jari Rantala	

PCT REQUEST

Original (for SUBMISSION) - printed on 31.03.1999 10:37:35 AM

47563

0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.83 (updated 01.03.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	47563
I	Title of invention	DELAY CONTROL METHOD
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	NOKIA TELECOMMUNICATIONS OY
II-5	Address:	P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	AHMAVAARA, Kalle
III-1-5	Address:	Ruostekuja 3 D 24 FIN-01610 Vantaa Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

47563

Original (for SUBMISSION) - printed on 31.03.1999 10:37:35 AM

III-2	Applicant and/or inventor	applicant and inventor
III-2-1	This person is:	US only
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	KEKKI, Sami
III-2-5	Address:	Ruusulankatu 8 A 1 FIN-00260 Helsinki Finland
III-2-6	State of nationality	FI
III-2-7	State of residence	FI
IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
IV-1-2	Address:	P.O.Box 16 FIN-00101 Helsinki Finland
IV-1-3	Telephone No.	358-9-693701
IV-1-4	Facsimile No.	358-9-6933944
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CU CZ DE DK EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG US UZ VN YU ZA ZW

PCT REQUEST

47563

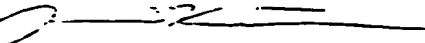
Original (for SUBMISSION) - printed on 31.03.1999 10:37:35 AM

V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	Exclusion(s) from precautionary designations	NONE	
VI-1	Priority claim of earlier national application		
VI-1-1	Filing date	31 March 1998 (31.03.1998)	
VI-1-2	Number	980735	
VI-1-3	Country	FI	
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	11	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	47563.txt
VIII-5	Drawings	3	-
VIII-7	TOTAL	21	
VIII-8	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of Official Action in FI980735	-
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	English	

PCT REQUEST

47563

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IX-1	Signature of applicant or agent	
IX-1-1	Name	BERGGREN OY AB
IX-1-2	Name of signatory	Juhani Kupiainen
IX-1-3	Capacity	Patent Agent

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/SE
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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PCT (ANNEX - FEE CALCULATION SHEET)

47563

Original (for SUBMISSION) - printed on 31.03.1999 10:37:35 AM

(This sheet is not part of and does not count as a sheet of the international application)

0	For receiving Office use only	
0-1	International Application No.	
0-2	Date stamp of the receiving Office	
0-4	Form - PCT/RO/101 (Annex)	
0-4-1	PCT Fee Calculation Sheet Prepared using	PCT-EASY Version 2.83 (updated 01.03.1999)
0-9	Applicant's or agent's file reference	47563
2	Applicant	NOKIA TELECOMMUNICATIONS OY, et al.
12	Calculation of prescribed fees	fee amount/multiplier total amounts (FIM)
12-1	Transmittal fee T	⇒ 800
12-2	Search fee S	⇒ 4 200
12-3	International fee Basic fee (first 30 sheets) b1	2 400
12-4	Remaining sheets	0
12-5	Additional amount (X)	55
12-6	Total additional amount b2	0
12-7	b1 + b2 = B	2 400
12-8	Designation fees Number of designations contained in international application	79
12-9	Number of designation fees payable (maximum 10)	10
12-10	Amount of designation fee (X)	550
12-11	Total designation fees D	5 500
12-12	PCT-EASY fee reduction R	-740
12-13	Total International fee (B+D-R) I	⇒ 7 160
12-14	Fee for priority document Number of priority documents requested	1
12-15	Fee per document (X)	122
12-16	Total priority document fee P	⇒ 122
12-17	TOTAL FEES PAYABLE (T+S+I+P)	⇒ 12 282
12-19	Mode of payment	cheque

VALIDATION LOG AND REMARKS

13-2-3	Validation messages Names	Green? Applicant 1.:Telephone No. missing
		Green? Applicant 1.:Facsimile No. missing

PCT (ANNEX - FEE CALCULATION SHEET)

47563

Original (for **SUBMISSION**) - printed on 31.03.1999 10:37:35 AM

(This sheet is not part of and does not count as a sheet of the international application)

0	For receiving Office use only		
0-1	International Application No.		
0-2	Date stamp of the receiving Office		
0-4	Form - PCT/RO/101 (Annex)		
0-4-1	PCT Fee Calculation Sheet Prepared using	PCT-EASY Version 2.83 (updated 01.03.1999)	
0-9	Applicant's or agent's file reference	47563	
2	Applicant	NOKIA TELECOMMUNICATIONS OY, et al.	
12	Calculation of prescribed fees	fee amount/multiplier	total amounts (FIM)
12-1	Transmittal fee T	⇒	800
12-2	Search fee S	⇒	4 200
12-3	International fee		
	Basic fee (first 30 sheets) b1	2 400	
12-4	Remaining sheets	0	
12-5	Additional amount (X)	55	
12-6	Total additional amount b2	0	
12-7	b1 + b2 = B	2 400	
12-8	Designation fees		
	Number of designations contained in international application	79	
12-9	Number of designation fees payable (maximum 10)	10	
12-10	Amount of designation fee (X)	550	
12-11	Total designation fees D	5 500	
12-12	PCT-EASY fee reduction R	-740	
12-13	Total International fee (B+D-R) I	⇒	7 160
12-14	Fee for priority document		
	Number of priority documents requested	1	
12-15	Fee per document (X)	122	
12-16	Total priority document fee P	⇒	122
12-17	TOTAL FEES PAYABLE (T+S+I+P)	⇒	12 282
12-19	Mode of payment	cheque	

VALIDATION LOG AND REMARKS

13-2-3	Validation messages Names	Green? Applicant 1.:Telephone No. missing
		Green? Applicant 1.:Facsimile No. missing

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below.

IPEA/ _____

By Express Mail
No. EL489905788US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND	
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 47563/ML	
International application No. PCT/FI99/00269	International filing date (day/month/year) 31 March 1999 (31.03.99)	(Earliest) Priority date (day/month/year) 31 March 1998 (31.03.98)	
Title of invention Delay control method			
Box No. II APPLICANT(S)			
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) NOKIA TELECOMMUNICATIONS OY P.O. Box 300, FIN-00045 NOKIA GROUP Finland		Telephone No.:	
		Facsimile No.:	
		Teleprinter No.:	
State (that is, country) of nationality: FINLAND		State (that is, country) of residence: FINLAND	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) AHMAVAARA, Kalle Ruostekuja 3 D 24, FIN-01610 VANTAA, Finland			
State (that is, country) of nationality: FINLAND		State (that is, country) of residence: FINLAND	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) KEKKI, Sami Ruusulankatu 8 A 1, FIN-00260 HELSINKI, Finland			
State (that is, country) of nationality: FINLAND		State (that is, country) of residence: FINLAND	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.			

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*BERGGREN OY AB
P.O. Box 16
FIN-00101 HELSINKI
Finland

Telephone No.:

+358 9 693 701

Facsimile No.:

+358 9 693 3944

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filedthe description ☒ as originally filed☐ as amended under Article 34the claims ☒ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☒ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (specify) | : | sheets |

For International Preliminary Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (specify): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



Markus Levlín
Patent Agent c/o Berggren Oy Ab

For International Preliminary Examining Authority use only

- | | |
|--|---|
| 1. Date of actual receipt of DEMAND: | |
| 2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b): | |
| 3. <input type="checkbox"/> The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. | <input type="checkbox"/> The applicant has been informed accordingly. |
| 4. <input type="checkbox"/> The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5. | |
| 5. <input type="checkbox"/> Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82. | |

For International Bureau use only

Demand received from IPEA on:

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No. PCT/FI99/00269	For International Preliminary Examining Authority use only													
Applicant's or agent's file reference 47563/ML	Date stamp of the IPEA													
Applicant <div style="text-align: center; margin-top: 10px;">Nokia Telecommunications Oy et al.</div>														
Calculation of prescribed fees														
1. Preliminary examination fee	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">EUR 1533</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">P</div>													
2. Handling fee <i>(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)</i>	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">EUR 148</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin-left: 5px;">H</div>													
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">EUR 1681</div>													
	<div style="border: 1px solid black; display: inline-block; padding: 2px 10px;">TOTAL</div>													
Mode of Payment														
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"><input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)</td> <td style="width: 33%;"><input type="checkbox"/> cash</td> <td style="width: 34%;"></td> </tr> <tr> <td><input type="checkbox"/> cheque</td> <td><input type="checkbox"/> revenue stamps</td> <td></td> </tr> <tr> <td><input type="checkbox"/> postal money order</td> <td><input type="checkbox"/> coupons</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> bank draft</td> <td><input type="checkbox"/> other (specify):</td> <td></td> </tr> </table>			<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash		<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps		<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons		<input checked="" type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):	
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash													
<input type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps													
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons													
<input checked="" type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):													
to be paid onto bank account No. 200118-182076 (EPO's bank account with Merita, Finland)														
Deposit Account Authorization <i>(this mode of payment may not be available at all IPEAs)</i>														
The IPEA/ _____ <input type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account.														
<input type="checkbox"/> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.														
Deposit Account Number _____	Date (day/month/year) _____	Signature _____												

PATENT COOPERATION TREATY

By Express Mail
No. EL489905788US

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:
BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Berggren Oy Ab
15-10-1999
MM ML

Date of mailing (day/month/year)
07 October 1999 (07.10.99)

Applicant's or agent's file reference
47563

IMPORTANT NOTICE

International application No.
PCT/FI99/00269

International filing date (day/month/year)
31 March 1999 (31.03.99)

Priority date (day/month/year)
31 March 1998 (31.03.98)



Applicant
NOKIA TELECOMMUNICATIONS OY et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

**AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GD,GE,GH,GM,HR,
HU,ID,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,
SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZA,ZW**

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
07 October 1999 (07.10.99) under No. WO 99/50972

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

J. Zahra

Facsimile No. (41-22) 740.14.35

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

By Express Mail
No. EL489905788US

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION

Berggren Oy AB
(PCT Rule 66) *AB*

25 -05- 2000

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Date of mailing
(day/month/year)

23.05.00

Applicant's or agent's file reference
47563/ML

REPLY DUE

within 1 month(s)
from the above date of mailing

23/6/00

International application No.
PCT/FI99/00269

International filing date (day/month/year)
31/03/1999

Priority date (day/month/year)
31/03/1998

International Patent Classification (IPC) or both national classification and IPC
H04B7/005

Applicant
NOKIA TELECOMMUNICATIONS OY et al.

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☐ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☒ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby **invited to reply** to this opinion.


When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 31/07/2000.

Name and mailing address of the international preliminary examining authority:

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

Ciccarese, C

Formalities officer (incl. extension of time limits)
Teschauer, B
Telephone No. +49 89 2399 8231



I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*).

Description, pages:

1-11 as originally filed

Claims, No.:

1-10 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item VII

Certain defects in the international application

- 1 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 2 A document reflecting the prior art on which the two-part form of the claims has been based, has not been identified in the description (Rule 5.1(a)(ii) PCT).
- 3 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising portion (Rule 6.3(b)(ii) PCT).

Re Item VIII

Certain observations on the international application

- 1 The expression "true spirit [...] of the invention" on page 11 (last line) is vague and unclear and leaves the reader in doubt as to its meaning, thereby rendering the definition of the subject-matter of the claims unclear (cf. PCT/GL/III/4.3a).
- 2 In claim 9, the wording "A system for controlling delays between a radio network controller and at least one base station in a cellular communications network" is unclear: said wording implies that the radio network controller, the base station and the cellular communications network are not part of the system although at least the first two are in the same claim indicated as being part of the system (cf. lines 4 and 8 of the claim) and, in fact, all of these three features are essential for the definition of the invention and should therefore be part of the claimed matter.
- 3 The wording "after a predetermined reception time" in line 20 of page 13 (claim 9) is unclear, since it is impossible to understand whether it refers to the reception of the data packet or to the sending of a timing adjustment, or how this reception time is defined.

This objection could be overcome by using a wording similar to that used in claim 1, e.g. the timing adjustment is sent if the data packet "arrives [...] outside a predefined time period". In fact, such a modification of claim 9 is essential to correctly define the invention.

- 4 The same objection of point 3 is valid for the corresponding wording in line 24 of page 13 (claim 9).
- 5 The attention of the applicant is drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the applications as filed. In particular, the subject-matter of the amended claims must be supported by the application as filed.

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/FI99/00269

- 6 In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based (see also Rule 66.8(a) PCT).

If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.

This applies to both the description and the claims.

PATENT COOPERATION TREATY

By Express Mail
No. EL489905788US

277 / ML

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

To: BERGGREN OY AB P.O. Box 16 FIN-00101 Helsinki FINLANDE <div style="text-align: right; margin-top: 10px;"><i>Berggren Oy Ab</i></div> <div style="text-align: center; margin-top: 10px;">11 -07- 2000</div> <div style="text-align: center; margin-top: 10px;">mm</div>

Date of mailing (day/month/year)	07. 07. 00
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Applicant's or agent's file reference 47563/ML	IMPORTANT NOTIFICATION
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International application No. PCT/FI99/00269	International filing date (day/month/year) 31/03/1999	Priority date (day/month/year) 31/03/1998
---	--	--

Applicant <i>Networks</i> NOKIA TELECOMMUNICATIONS OY et al.
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1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/ <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Mader, D Tel. +49 89 2399-2744	
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 47563/ML	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00269	International filing date (day/month/year) 31/03/1999	Priority date (day/month/year) 31/03/1998
International Patent Classification (IPC) or national classification and IPC H04B7/005		
Applicant NOKIA TELECOMMUNICATIONS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 27/10/1999	Date of completion of this report 07.07.00
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Cicarese, C Telephone No. +49 89 2399 7302 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00269

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-3,5-10	as originally filed	
4,11	with telefax of	13/06/2000

Claims, No.:

1-10	with telefax of	13/06/2000
------	-----------------	------------

Drawings, sheets:

1/3-3/3	as originally filed
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2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00269

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00269

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Citation:

D1 = WO 9716040

2 The application belongs to the field of cellular telecommunications networks. The goal is to limit delays and to keep the different elements of the network synchronized.

3 Claims 1, 5 and 9 are regarded as novel and inventive for the following reasoning:

A node of a telecommunications network sends back a timing adjustment signal to a second node when receiving a data packet outside a predefined time period from said second node. This feature is not hinted at in the cited document nor in the other documents cited in the international search report.

4 The dependent claims concern advantageous embodiments of the subject-matter of the independent claims and thus their subject-matter is also considered to be novel and inventive.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00269

Re Item VII

Certain defects in the international application

- 1 A document reflecting the prior art on which the two-part form of the claims has been based, has not been identified in the description (Rule 5.1(a)(ii) PCT).
- 2 The two-part form used in the independent claims does not seem to have been formulated as appropriate, with those features known in combination from the prior art being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising portion (Rule 6.3(b)(ii) PCT).

Re Item VIII

Certain observations on the international application

- 1 Although the system claim 9 corresponds to method claims 1 and 5, the definition of the conditions which lead the network controller and/or the intermediate node to send a timing adjustment are expressed in a different way with respect to the one used for the nodes in claims 1 and 5. Claims 1 (uplink method), 5 (downlink method) and 9 (system) appear to relate effectively to the same subject-matter but still to differ from each other with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. Lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection, especially in view of the fact that a different language is used to describe the same concept.

Hence, said claims do not meet the requirements of Article 6 PCT.

Rephrasing the definition of the conditions according to which timing adjustment signals are sent in claim 9 (page 13, lines 19-21 ("as a response... time period") and lines 23-24 ("as a response...reception time")) by adapting the one used in claim 1 (page 12, lines 7-9)) would overcome this objection (also cf. point VIII.2).

- 2 The wording "after a predetermined time period" in line 21 of page 13 (claim 9) is unclear, since it is impossible to understand whether it refers to the reception of the data packet or to the sending of a timing adjustment, or how this reception time is defined.

This objection could be overcome by complying with paragraph VIII.1. In fact, such a modification of claim 9 is essential to correctly define the invention.

- 3 The same objection of point 3 is valid for the corresponding wording in line 24 of page 13 (claim 9).

09/646776

4

422 Rec'd PCT/PTO 21 SEP 2000.

The method for delay control adjustment in the uplink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the uplink direction. The method for delay control adjustment in the downlink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the downlink direction. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a system. The dependent claims describe further advantageous embodiments of the invention.

The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late (outside a predefined time period), whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station.

In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates a hierarchical network structure according to prior art,

Figure 2 illustrates an example of messaging according to an advantageous embodiment of the invention, and

09/646776

11 422 Rec'd PCT/PTO 21 SEP 2000

combining of packets, and necessary adjustments, e.g. changing the transmission rate of a transmission link. In some embodiments of the invention, such entities may comprise one or more functional blocks, such as e.g. a block performing the combining of packets and a block performing the control of transmission links. As a
5 man skilled in the art knows, such entities can be constructed in many ways. Therefore, the description of entities as integral entities in the previous examples is intended to be only an example. Such description is used in this specification for the purposes of clarity only.

10 Although in the previous examples, the delay control method according to the invention has been described using a tree structure formed by the entities of the telecommunications network, the invention is not limited to implementation in a tree structure. The method for uplink and downlink delay control according to the
15 invention can also be used in a chain structure.

20 In the following claims, the term node is used for the various previously described entities, such as the combining and splitting units, radio network controllers and base stations. In the following claims, the terms preceding and following are to be interpreted in view of the data flow to the specified direction. As an example, a radio network controller precedes a base station in the downlink direction, since in the downlink direction, data packets pass first through a radio network controller, and only after that through a base station. Similarly, a base station precedes a radio
25 network controller in the uplink direction, since in the uplink direction, data packets pass first through a base station, and only after that through a radio network controller. Further, the term intermediate node refers to an entity in the transmission path between the protocol control block of a radio network controller and a base station. Such an intermediate node may be for example single unit or a group of units performing the duties of a splitting unit and a combining unit.

30 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible.

Claims

1. A method for delay control adjustment in the uplink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, characterized in that
5 at least one first node sends (130) a timing adjustment command to at least one second node, if at least one uplink data packet sent by said at least one second node arrives at said at least one first node at a point in time, which point in time is outside a predefined time period, and
10 at least one node functions as said at least one first node in view of at least one node preceding it in the uplink direction in the network structure, and as said at least one second node in view of at least one node following it in the uplink direction in the network structure.
- 15 2. A method according to claim 1, characterized in that at least one of said at least one second node is a base station (20).
3. A method according to claim 1, characterized in that at least one of said at least one first node is a protocol control block (32) of a radio network controller.
- 20 4. A method according to claim 1, characterized in that at least one of said nodes is a combining unit (33).
5. A method for delay control adjustment in the downlink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, characterized in that
25 at least one second node sends (230) a timing adjustment request to at least one first node, if at least one downlink data packet sent by said at least one first node arrives at said at least one second node at a point in time, which point in time is outside a
30 predefined time period, and
at least one node functions as said at least one second node in view of at least one node preceding it in the downlink direction in the network structure, and as said at least one first node in view of at least one node following it in the downlink direction in the network structure.
- 35 6. A method according to claim 5, characterized in that at least one of said at least one second node is a base station (20).

7. A method according to claim 5, **characterized** in that at least one of said at least one first node is a protocol control block (32) of a radio network controller.

5 8. A method according to claim 5, **characterized** in that at least one of said nodes is a splitting unit (33).

9. A system in a cellular telecommunications network for controlling delays between a radio network controller and at least one base station, **characterized** in that

10 the system comprises

- a radio network controller for controlling the transfer of data,
- at least one intermediate node (33) for forwarding data in the network, which at least one intermediate node node is functionally connected to said radio network controller, and

15 - a base station (20) for sending and receiving data, which base station is functionally connected to said at least one intermediate node,
and in that,

20 - said radio network controller is arranged to send a timing adjustment command to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node after a predetermined time period,

- and said at least one intermediate node is arranged to send a timing adjustment command to said base station as a response to reception of at least one data packet from said base station after a predetermined time period.

25

10. A system according to claim 9, **characterized** in that said base station (20) is arranged to send a timing adjustment request to at least one of said at least one intermediate node (33) as a response to reception of at least one data packet from said at least one of said at least one intermediate node after a
30 predetermined time period.

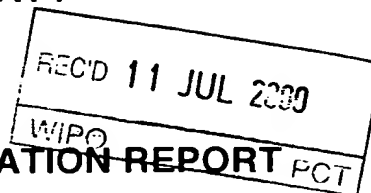
REPLACED BY
ART 34 AMDT

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT PCT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference 47563/ML	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00269	International filing date (day/month/year) 31/03/1999	Priority date (day/month/year) 31/03/1998
International Patent Classification (IPC) or national classification and IPC H04B7/005		
Applicant NOKIA ^{NETWORKS} [TELECOMMUNICATIONS] OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 27/10/1999	Date of completion of this report 07.07.00
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Ciccarese, C Telephone No. +49 89 2399 7302 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00269

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-3,5-10	as originally filed	
4,11	with telefax of	13/06/2000

Claims, No.:

1-10	with telefax of	13/06/2000
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Drawings, sheets:

1/3-3/3	as originally filed
---------	---------------------

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00269

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Citation:

D1 = WO 9716040

2 The application belongs to the field of cellular telecommunications networks. The goal is to limit delays and to keep the different elements of the network synchronized.

3 Claims 1, 5 and 9 are regarded as novel and inventive for the following reasoning:

A node of a telecommunications network sends back a timing adjustment signal to a second node when receiving a data packet outside a predefined time period from said second node. This feature is not hinted at in the cited document nor in the other documents cited in the international search report.

4 The dependent claims concern advantageous embodiments of the subject-matter of the independent claims and thus their subject-matter is also considered to be novel and inventive.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00269

Re Item VII

Certain defects in the international application

- 1 A document reflecting the prior art on which the two-part form of the claims has been based, has not been identified in the description (Rule 5.1(a)(ii) PCT).
- 2 The two-part form used in the independent claims does not seem to have been formulated as appropriate, with those features known in combination from the prior art being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising portion (Rule 6.3(b)(ii) PCT).

Re Item VIII

Certain observations on the international application

- 1 Although the system claim 9 corresponds to method claims 1 and 5, the definition of the conditions which lead the network controller and/or the intermediate node to send a timing adjustment are expressed in a different way with respect to the one used for the nodes in claims 1 and 5. Claims 1 (uplink method), 5 (downlink method) and 9 (system) appear to relate effectively to the same subject-matter but still to differ from each other with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. Lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection, especially in view of the fact that a different language is used to describe the same concept.

Hence, said claims do not meet the requirements of Article 6 PCT.

Rephrasing the definition of the conditions according to which timing adjustment signals are sent in claim 9 (page 13, lines 19-21 ("as a response... time period") and lines 23-24 ("as a response...reception time")) by adapting the one used in claim 1 (page 12, lines 7-9)) would overcome this objection (also cf. point VIII.2).

- 2 The wording "after a predetermined time period" in line 21 of page 13 (claim 9) is unclear, since it is impossible to understand whether it refers to the reception of the data packet or to the sending of a timing adjustment, or how this reception time is defined.

This objection could be overcome by complying with paragraph VIII.1. In fact, such a modification of claim 9 is essential to correctly define the invention.

- 3 The same objection of point 3 is valid for the corresponding wording in line 24 of page 13 (claim 9).

The method for delay control adjustment in the uplink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the uplink direction. The method for delay control adjustment in the downlink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the downlink direction. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a system. The dependent claims describe further advantageous embodiments of the invention.

The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late, whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station.

In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates a hierarchical network structure according to prior art,

Figure 2 illustrates an example of messaging according to an advantageous embodiment of the invention, and

combining of packets, and necessary adjustments, e.g. changing the transmission rate of a transmission link. In some embodiments of the invention, such entities may comprise one or more functional blocks, such as e.g. a block performing the combining of packets and a block performing the control of transmission links. As a
5 man skilled in the art knows, such entities can be constructed in many ways. Therefore, the description of entities as integral entities in the previous examples is intended to be only an example. Such description is used in this specification for the purposes of clarity only.

10 Although in the previous examples, the delay control method according to the invention has been described using a tree structure formed by the entities of the telecommunications network, the invention is not limited to implementation in a tree structure. The method for uplink and downlink delay control according to the invention can also be used in a chain structure.

15 In the following claims, the term node is used for the various previously described entities, such as the combining and splitting units, radio network controllers and base stations. In the following claims, the terms preceding and following are to be interpreted in view of the data flow to the specified direction. As an example, a
20 radio network controller precedes a base station in the downlink direction, since in the downlink direction, data packets pass first through a radio network controller, and only after that through a base station. Similarly, a base station precedes a radio network controller in the uplink direction, since in the uplink direction, data packets
25 pass first through a base station, and only after that through a radio network controller. Further, the term intermediate node refers to an entity in the transmission path between the protocol control block of a radio network controller and a base station. Such an intermediate node may be for example single unit or a group of units performing the duties of a splitting unit and a combining unit.

30 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

35

Claims

1. A method for delay control adjustment in the uplink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, **characterized** in that
5 at least one first node sends a timing adjustment command to at least one second node, if at least one uplink data packet sent by said at least one second node arrives at said at least one first node at a point in time, which point in time is outside a predefined time period, and
10 at least one third node functions as a said at least one first node in view of at least one node preceding it in the uplink direction in the network structure, and as a said at least one second node in view of at least one node following it in the uplink direction in the network structure.
- 15 2. A method according to claim 1, **characterized** in that at least one of said at least one second node is a base station.
3. A method according to claim 1, **characterized** in that at least one of said at least one first node is a protocol control block of a radio network controller.
20
4. A method according to claim 1, **characterized** in that at least one of said nodes is a combining unit.
5. A method for delay control adjustment in the downlink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, **characterized** in that
25 at least one second node sends a timing adjustment request to at least one first node, if at least one downlink data packet sent by said at least one first node arrives at said at least one second node at a point in time, which point in time is outside a
30 predefined time period, and
at least one third node functions as a said at least one second node in view of at least one node preceding it in the downlink direction in the network structure, and as a said at least one second node in view of at least one node following it in the downlink direction in the network structure.
35
6. A method according to claim 5, **characterized** in that at least one of said at least one second node is a base station.

7. A method according to claim 5, **characterized** in that at least one of said at least one first node is a protocol control block of a radio network controller.

8. A method according to claim 5, **characterized** in that at least one of said
5 nodes is a splitting unit.

9. A system for controlling delays between a radio network controller and at least one base station in a cellular telecommunications network, **characterized** in that the system comprises

- 10 - a radio network controller for controlling the transfer of data,
- at least one intermediate node for forwarding data in the network, which at least one intermediate node node is functionally connected to said radio network controller, and
- a base station for sending and receiving data, which base station is functionally
15 connected to said at least one intermediate node,
and in that,
- said radio network controller is arranged to send a timing adjustment command to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node
20 after a predetermined reception time,
- and said at least one intermediate node is arranged to send a timing adjustment command to said base station as a response to reception of at least one data packet from said base station after a predetermined reception time.

25 10. A system according to claim 9, **characterized** in that said base station is arranged to send a timing adjustment request to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node after a predetermined reception time.

30

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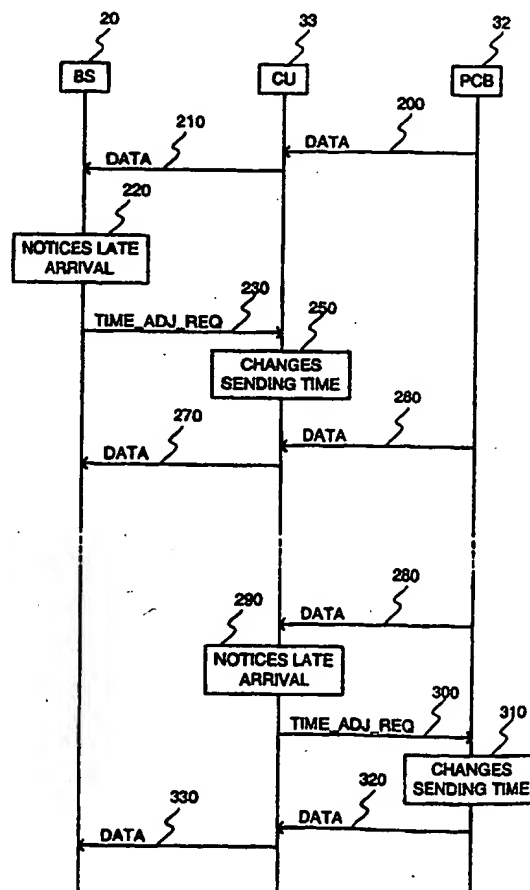
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(57) Abstract

The invention is directed to a method for controlling delays in a cellular telecommunications network. The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late, whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station. In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.



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Delay control method**TECHNICAL FIELD OF THE INVENTION**

- 5 The invention is directed to a method for controlling delays in a cellular telecommunications network.

BACKGROUND OF THE INVENTION

- 10 Modern cellular telecommunication systems comprise complicated structures of network elements. New developments, such as macro diversity combining, increase the complexity of a network. Macro diversity combining (MDC) refers to a situation, where terminal unit of a cellular telecommunication system has simultaneous connections to at least two base stations, in which case any given data
- 15 unit can be routed to the terminal unit or from the terminal unit via at least two routes. The set of such base stations is called the active set. Macro diversity - combining can be utilized especially in spread spectrum technology based systems, when the terminal unit is near the border of cells or in an area, where more than one cells overlap at least partly. One of the advantages of macro diversity combining
- 20 (MDC) is the resistance to various disturbances occurring in the propagation paths. Since fading and disturbances occurring in a given propagation path can be compensated using data transmitted via another propagation path, MDC provides a better quality of transmission than schemes based on use of single connections.
- 25 In cellular systems based on spread spectrum technology, it is advantageous to minimize the transmission power of mobile and base stations in order to maximize the capacity of the system. Macro diversity combining allows the use of lower transmitting power than in a system, where all other things being equal, the radio link between the mobile station and the network is carried by a single connection.
- 30 On the other hand, spread spectrum technology offers good possibilities to combine signal components arriving to the combination location with varying delays and power levels, due to different propagation paths or macro diversity paths. Due to these reasons, the use of macro diversity combining will increase in the future. The most common application of spread spectrum technology is the CDMA (Code
- 35 Division Multiple Access) cellular telecommunication technology.

An example of a radio network configuration providing macro diversity combining is shown in figure 1. Downlink data is transmitted from the protocol control block

32 in the first radio network controller (RNC) RNC1 30 to the first splitting unit 34 in the RNC1, which splitting unit replicates the downlink data stream into one stream towards a second splitting unit 34 in the RNC1, and another data stream towards the splitting unit 34 in RNC2. The second splitting unit 34 in RNC1 replicates the received data stream into one stream towards a first base station (BS) 20 and another data stream towards a second base station 20. The splitting unit 34 in RNC2 further replicates the received data stream into one stream towards a third base station 20 and another data stream towards a fourth base station 20.

Uplink data from the mobile station (MS) 10 is received separately by each base station 20. The first and second base stations send the received data packets to the second combining unit 33 in RNC1, and the third and fourth base stations send the received data packets to the combining unit 33 in RNC2. When the combining units 33 have received the packets, they combine the packets and send only one packet further. The first combining unit 33 receives the output from the other two combining units, and combines the data packets, and forwards the combined data packets to the protocol control block 32.

The combining units 33 may perform the combining in many ways. For example, the units may select only one of the two received packets and send the selected packet. They also may combine the signals of the two packets and send the combined packet.

For clarity, the splitting 34 and combining 33 units are represented by a single symbol in figure 1.

In such a configuration, problems are caused by the fact that each downlink packet has to be sent from each BS towards the MS at roughly the same time or within a small time window, while the delay from the RNC to base stations varies. The delay variation may be caused by numerous reasons. For example, physical distance and transmission links between base stations and the radio network controller changes when the base station (BS) or base stations used by a mobile station (MS) is/are changed. Further, each part of the chain of transmission links can have different properties such as bitrate and characteristic delay variation, which properties may change due to variations in traffic or for other reasons. Delays are in turn caused for example by the physical length of the transmission links, and processing of the transmitted data in the network entities. Such processing can for example be encoding, splitting, or combining of data packets. A further problem in downlink

direction is, how to keep the difference between the sending time of packets from RNC and transmission time of the packets by the base stations in minimum, while still fulfilling the edge condition, that each BS receives the data before it has to be transmitted.

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In the uplink direction, a problem is how to determine the combining time for each combining/splitting unit, while still fulfilling the edge condition that the combined data packet is to be received by the protocol control block by the defined time. The combining time is the point in time, by which a combining unit must send the combined data to its output, regardless of whether all packets to be combined are received or not.

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An additional problem, which is not solved by the prior art structures, is how to take advantage of statistical multiplexing gains resulting of multiplexing of transmission links, since the more efficiently the data is multiplexed, the longer the average delay is and especially, the longer the delay variation is. Statistical multiplexing gains refer to savings in the use of data transmission resources obtained, when the data packet transmission times and other transmission parameters of bearers having relatively loose delay requirements are adjusted in order to accommodate data packets of bearers having stricter delay requirements.

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The prior art solutions do not address all of the previous problems. One prior art solution is used in the GSM system, where in the downlink direction, a base station can indicate to a transcoder unit, that the transcoder unit has to advance the transmission times of frames sent towards the base station. This mechanism is explained in detail in the specification GSM 08.60.

SUMMARY OF THE INVENTION

30

The object of the invention is to realize a delay control method for allowing more accurate control of delays than in the prior art systems. A further object of the invention is to realize a delay control method, which allows a modular network structure to be used in the implementation of the method.

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The objects are reached by performing the delay control in a hierarchical way using a tree-like delay adjustment hierarchy, where each node of the tree adjusts the delay of its branches.

The method for delay control adjustment in the uplink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the uplink direction. The method for delay control adjustment in the downlink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the downlink direction. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a system. The dependent claims describe further advantageous embodiments of the invention.

The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late, whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station.

In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates a hierarchical network structure according to prior art,

Figure 2 illustrates an example of messaging according to an advantageous embodiment of the invention, and

Figure 3 illustrates an example of messaging according to an advantageous embodiment of the invention.

Same reference numerals are used for similar entities in the figures.

5

DETAILED DESCRIPTION

Adjustment of delays in the downlink direction

10 In the downlink direction, the delays are adjusted as follows according to an advantageous embodiment of the invention. If an entity, herein called the receiving entity, receives packets too late for one or more bearers, or if packets are received too early, before a certain predefined point in time, the receiving entity informs the entity preceding it in the downlink direction in the transmission path about the
15 inaccurate timing. As a response, the preceding entity adjusts the transmission time of the packets to bring the arrival time of the packets to the receiving entity closer to the desired arrival time. In case the preceding entity cannot send the packets earlier due to the arrival time of packets to the preceding entity, the preceding entity may also inform the entity before it in the downlink direction of the transmission path,
20 that the packets are received too early. Preferably, this mechanism of informing and adjustment is executed at each entity below the radio network controller in a downlink transmission path, thus forming a chain of delay controlling nodes from the RNC to each base station controlled by the RNC. In an advantageous embodiment of the invention, the base stations are the lowest level entities which
25 send timing reports, and the controlling, i.e. the anchor RNC is the highest level entity reacting to the timing reports.

The invention is not limited to such an embodiment, where all entities between the RNC and a base station participate in the delay control. In some embodiments of the
30 invention, at least one of the intermediate entities such as splitting units between the RNC and a base station does not perform delay controlling. For example, in such an embodiment, the base stations may send a report of the packet arrival times, which report is merely sent further by the entities between the base station and the protocol control block of the RNC, and which report is finally received by the protocol
35 control block, which subsequently adjusts the transmission time of downlink data packets.

In one advantageous embodiment of the invention, the transmission time of downlink data packets from an entity is determined by the link having longest delay estimate, i.e. by the latest reported arrival time.

- 5 In some embodiments of the invention, the receiving entity may inform the preceding entity about the timing repeatedly, with predetermined intervals, even if packets are not received too late or too early. The preceding entity then only reacts to the report, if the timing deviates too much from the desired optimum timing.
- 10 In an advantageous embodiment of the invention, the delay can be controlled separately for each bearer or commonly for all bearers for a mobile station. Delay control of all bearers allows simple adjustment of all bearers for example in a situation, when the transmission link configuration changes e.g. due to a handover, which usually affects all bearers of a mobile station in substantially similar way.
- 15 Each splitting unit causes also processing delay, and since the number of splitting units in a transmission path can vary when the transmission link configuration changes, the delay between a base station and the radio network controller can change stepwise for all bearers of a mobile station passing through a single base station. On the other hand, delay control of single bearers allows producing of
- 20 different delays for different bearers, which in turn allows more efficient multiplexing of transmission links for bearers having less strict delay requirements. In a further embodiment of the invention, the delay can be controlled for a group of bearers as well. Therefore, a timing report may comprise identification and timing data for a single bearer, identification and timing data for multiple bearers, or
- 25 identification and timing data for all bearers of a mobile station. For example, in terms of one set of specifications for an UMTS cellular system, a timing report may be specific to a certain RLC protocol, or a group of RLC protocols, or specific to a MAC protocol.
- 30 Figure 2 illustrates an example of messaging in an exemplary embodiment of the invention. Figure 2 illustrates the exchange of messages between a base station (BS) 20, a combining unit (CU) 33 and a protocol control block (PCB) 32 of a radio network controller. First, the protocol control block sends 200 one or more data packets to the combining unit. The combining unit forwards 210 the data packets to
- 35 the base station. In this example, the data packets arrive too late to the base station, which subsequently notices 220 the late arrival. As a response, the base station sends 230 a timing adjustment request TIME_ADJ_REQ to the combining unit. The combining unit checks, if it can send the data earlier. In this example it can, and the

combining unit subsequently changes 250 the sending time to an earlier time. After the change, the data transfer continues as usual, i.e. the protocol control block sends 260 one or more data packets to the combining unit, which forwards 270 the data packets to the base station. The data transmission continues, until at a later time in
5 this example, the network configuration changes in a way, which results in an increased delay between the combining unit 33 and the protocol control block 32. Subsequently, when the protocol control block sends 280 one or more data packets to the combining unit, the combining unit notices 290, that the data packets arrive too late for the combining unit to send them to the base station. As a response, the
10 combining unit sends 300 a timing adjustment request TIME_ADJ_REQ to the protocol control block. Due to the request, the protocol control block changes 310 the sending time in use. After the change, the data transfer continues as usual, i.e. the protocol control block sends 320 one or more data packets to the combining unit, which forwards 330 the data packets to the base station.

15

Adjustment of delays in the uplink direction

Each entity in the transmission path, such as a combining unit, may inform the entity preceding it in the uplink direction in the transmission path, if data packets
20 from the preceding entity arrive too late or too early. Each entity may further indicate, how much the arrival time of packets deviate from the desired optimum time. The preceding entity may consequently change the transmission time of data to correct the deviation. The entity receiving the data may also command the preceding entity to send the data at a specified time. For example, the receiving
25 entity may command the preceding entity to adjust the data sending time a certain amount of time earlier. In the case of combining units, the data sending time may be the combining time.

If the preceding entity itself receives data so late, that it cannot send the data any
30 earlier, it may in turn command the entity or the entities preceding it to send data earlier. In this way, the delay is recursively adjusted in the chain- or tree-like structure formed by the entities from end to end.

In some situations, the data sending time of an entity cannot be changed to an earlier
35 time. For example, if a base station sends the received data in the uplink direction as soon as possible, and any eventual intermediate entities such as combining units along the path also send the data as soon as possible, the sending time of the base station or any of these intermediate entities cannot be changed to an earlier time. In

such a case, the base station or base stations in question may be excluded from the active set.

In an advantageous embodiment of the invention, each entity may instead of sending a transmission time changing command to a preceding entity, enhance the transmission link between itself and the preceding entity in order to reduce delay. The transmission link may be enhanced for example by allocating more transmission time for the delayed connection. Other methods for increasing the data throughput rate of a connection may be used as well.

Preferably, the entity at the root of the delay control hierarchy, such as the controlling RNC, gives as much time for the entities preceding it in the uplink direction of the delay control hierarchy, i.e. by setting the desired arrival time of uplink data as late as the delay specifications of the involved bearer or bearers allow. Preferably, one or more of the intermediate entities in the transmission path between the controlling RNC and base stations also allow as much time as possible for the other entities preceding the entity in question.

In an advantageous embodiment of the invention, the delay can be controlled separately for each bearer or commonly for all bearers for a mobile station. Delay control of all bearers allows simple adjustment of all bearers for example in a situation, when the transmission link configuration changes e.g. due to a handover, which usually affects all bearers of a mobile station in substantially similar way. Each combining unit causes also processing delay, and since the number of combining units in a transmission path can vary when the transmission link configuration changes, the delay between a base station and the radio network controller can change stepwise for all bearers of a mobile station passing through a single base station. On the other hand, delay control of single bearers allows producing of different delays for different bearers, which in turn allows more efficient multiplexing of transmission links for bearers having less strict delay requirements. In a further embodiment of the invention, the delay can be controlled for a group of bearers as well. Therefore, a timing adjustment command may comprise identification and timing data for a single bearer, identification and timing data for multiple bearers, or identification and timing data for all bearers of a mobile station. For example, in terms of one set of specifications for an UMTS cellular system, a timing adjustment command may be specific to a certain RLC protocol, or a group of RLC protocols, or specific to a MAC protocol.

Figure 3 illustrates an example of messaging in an exemplary embodiment of the invention. Figure 3 illustrates the exchange of messages between a base station (BS) 20, a combining unit (CU) 33 and a protocol control block (PCB) 32 of a radio network controller. First, the base station sends 100 one or more data packets to the combining unit. The combining unit forwards 110 the data packets to the protocol control block. In this example, the data packets arrive too late to the protocol control block, which subsequently notices 120 the late arrival. As a response, the protocol control block sends 130 a timing adjustment command TIME_ADJ_CMD to the combining unit. The combining unit checks 140, if it can change the combining time to an earlier time. In this example, the combining unit receives packets from the base station so late, that the combining unit cannot send the packets earlier, if the base station does not change its sending time. Subsequently the combining unit sends 150 a timing adjustment command TIME_ADJ_CMD to the base station. In this example, the base station can change its sending time to an earlier time, and subsequently makes 160 the change. After changing the sending time, the base station continues sending 170 data to the combining unit, which forwards 180 the data to the protocol control block.

Further advantageous embodiments of the invention

The method according to the invention can advantageously implemented in a network structure, whose transmission links are implemented using technology, which allows the parameters of a connection to be adjusted. Although the method according to the invention is advantageously implemented in transmission networks having adjustable transmission links, the method according to the invention can also be used in cases, when one or more of the transmission links are not adjustable. For example, if a data transmission link between a first combining unit receiving data from a second combining unit and the second combining unit is not adjustable, the delay control may be performed in the previously described way by treating the first and second combining units as a single unit. This may be realized for example by treating the inputs of the second combining unit as inputs of the first unit, and treating the delay created by the processing in the second combining unit and by the non-adjustable link as internal processing delays of the first combining unit. This structure may require special messaging between entities controlling the first and second combining units, or for example the creation of a single entity controlling both the first and the second combining unit.

The delay control method according to the invention is not dependent on what entities execute the method. Although the previous examples describe the delay control method using combining units and the protocol control blocks of a RNC as examples, any other entity in the transmission path can participate in the implementation of the method.

The delay control method according to the invention has many advantages. For example, since the delay control can be performed as a chain of independently controlling entities, the implementation of the delay control in a complicated network is simplified, since each controlling entity does not need to know the details of the structure it is controlling. Each controlling entity simply communicates with a lower-level entity, which in turn takes care of controlling entities in the following lower level. This property simplifies the construction of a network using equipment from multiple vendors, since the controlling entity does not need to know how a certain adjustment is implemented in a proprietary internal structure of the controlled entity and the possible proprietary structure of the entities managed by the controlled entity.

In different embodiments of the invention, the number of various entities, such as for example splitting units, combining units, base stations, and radio network controllers may be different, and differ from the number of corresponding entities in any of the examples and figures of this specification. The entities may also be realised and combined in differing ways, for example, one radio network controller can comprise one or more combining units and splitting units. Therefore, the messaging and functionality described by the previous examples can be performed between a radio network controller and a base station, i.e. across the Iub interface, and for example also between two radio network controllers, i.e. across the Iur interface.

The name of a given functional entity, such as the radio network controller, is often different in the context of different cellular telecommunication systems. For example, in the GSM system the functional entity corresponding to a RNC is the base station controller (BSC). Therefore, the term radio network controller in the claims is intended to cover all corresponding functional entities regardless of the term used for the entity in the particular cellular telecommunication system.

In the previous examples, the various entities such as combining units were described as integral entities performing all of the duties of the entity, e.g.

combining of packets, and necessary adjustments, e.g. changing the transmission rate of a transmission link. In some embodiments of the invention, such entities may comprise one or more functional blocks, such as e.g. a block performing the combining of packets and a block performing the control of transmission links. As a
5 man skilled in the art knows, such entities can be constructed in many ways. Therefore, the description of entities as integral entities in the previous examples is intended to be only an example. Such description is used in this specification for the purposes of clarity only.

10 Although in the previous examples, the delay control method according to the invention has been described using a tree structure formed by the entities of the telecommunications network, the invention is not limited to implementation in a tree structure. The method for uplink and downlink delay control according to the invention can also be used in a chain structure.

15 In the following claims, the term node is used for the various previously described entities, such as the combining and splitting units, radio network controllers and base stations. In the following claims, the terms preceding and following are to be interpreted in view of the data flow to the specified direction. As an example, a
20 radio network controller precedes a base station in the downlink direction, since in the downlink direction, data packets pass first through a radio network controller, and only after that through a base station. Similarly, a base station precedes a radio network controller in the uplink direction, since in the uplink direction, data packets pass first through a base station, and only after that through a radio network
25 controller. Further, the term intermediate node refers to an entity in the transmission path between the protocol control block of a radio network controller and a base station. Such an intermediate node may be for example single unit or a group of units performing the duties of a splitting unit and a combining unit.

30 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

35

Claims

1. A method for delay control adjustment in the uplink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, characterized in that
5 at least one first node sends a timing adjustment command to at least one second node, if at least one uplink data packet sent by said at least one second node arrives at said at least one first node at a point in time, which point in time is outside a predefined time period, and
10 at least one third node functions as a said at least one first node in view of at least one node preceding it in the uplink direction in the network structure, and as a said at least one second node in view of at least one node following it in the uplink direction in the network structure.
- 15 2. A method according to claim 1, characterized in that at least one of said at least one second node is a base station.
3. A method according to claim 1, characterized in that at least one of said at least one first node is a protocol control block of a radio network controller.
- 20 4. A method according to claim 1, characterized in that at least one of said nodes is a combining unit.
5. A method for delay control adjustment in the downlink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, characterized in that
25 at least one second node sends a timing adjustment request to at least one first node, if at least one downlink data packet sent by said at least one first node arrives at said at least one second node at a point in time, which point in time is outside a predefined time period, and
30 at least one third node functions as a said at least one second node in view of at least one node preceding it in the downlink direction in the network structure, and as a said at least one second node in view of at least one node following it in the downlink direction in the network structure.
- 35 6. A method according to claim 5, characterized in that at least one of said at least one second node is a base station.

7. A method according to claim 5, characterized in that at least one of said at least one first node is a protocol control block of a radio network controller.

5 8. A method according to claim 5, characterized in that at least one of said nodes is a splitting unit.

9. A system for controlling delays between a radio network controller and at least one base station in a cellular telecommunications network, characterized in that the system comprises

- 10 - a radio network controller for controlling the transfer of data,
- at least one intermediate node for forwarding data in the network, which at least one intermediate node is functionally connected to said radio network controller, and
- a base station for sending and receiving data, which base station is functionally
15 connected to said at least one intermediate node,
and in that,
- said radio network controller is arranged to send a timing adjustment command to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node
20 after a predetermined reception time,
- and said at least one intermediate node is arranged to send a timing adjustment command to said base station as a response to reception of at least one data packet from said base station after a predetermined reception time.

25 10. A system according to claim 9, characterized in that said base station is arranged to send a timing adjustment request to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node after a predetermined reception time.

30

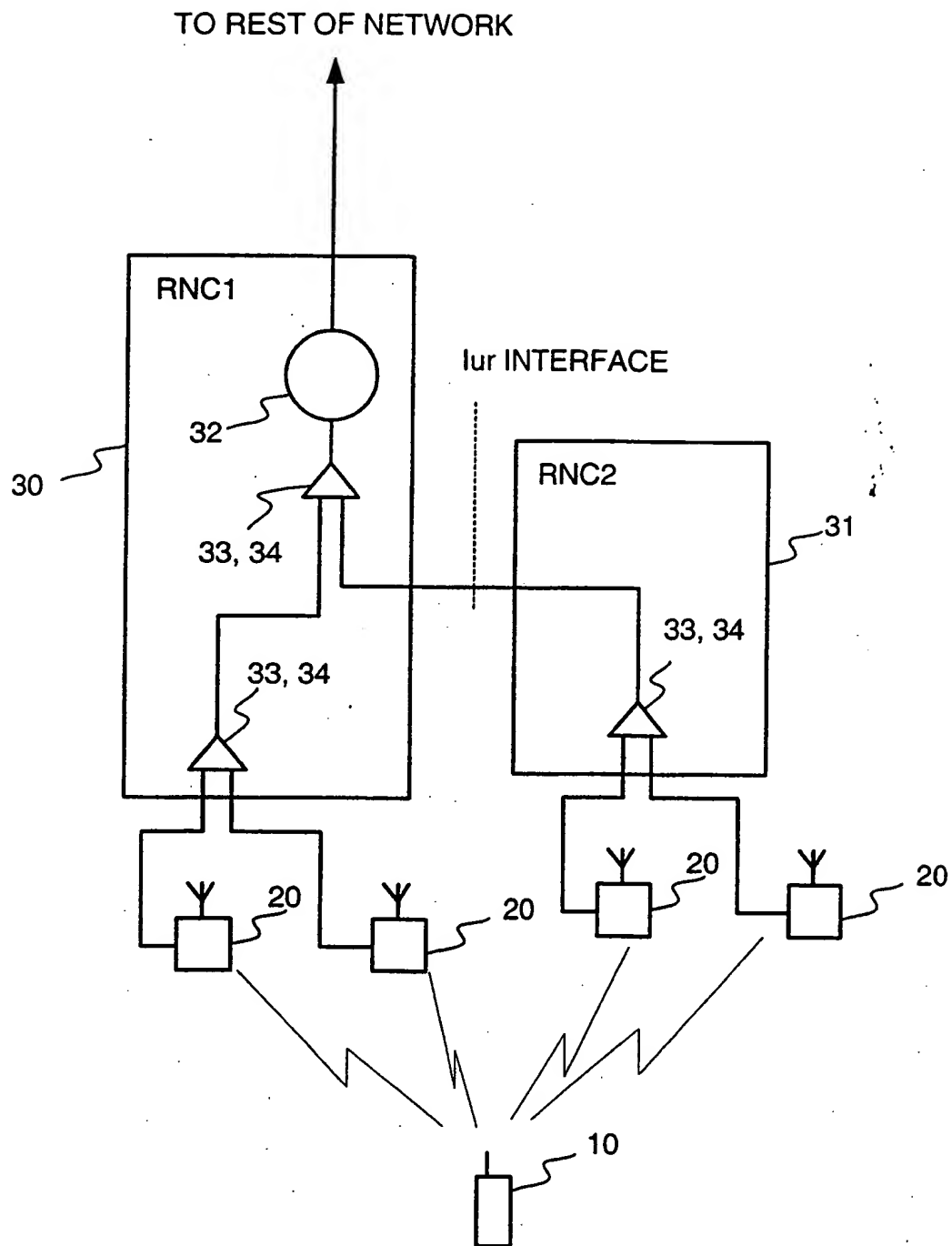


Fig. 1
PRIOR ART

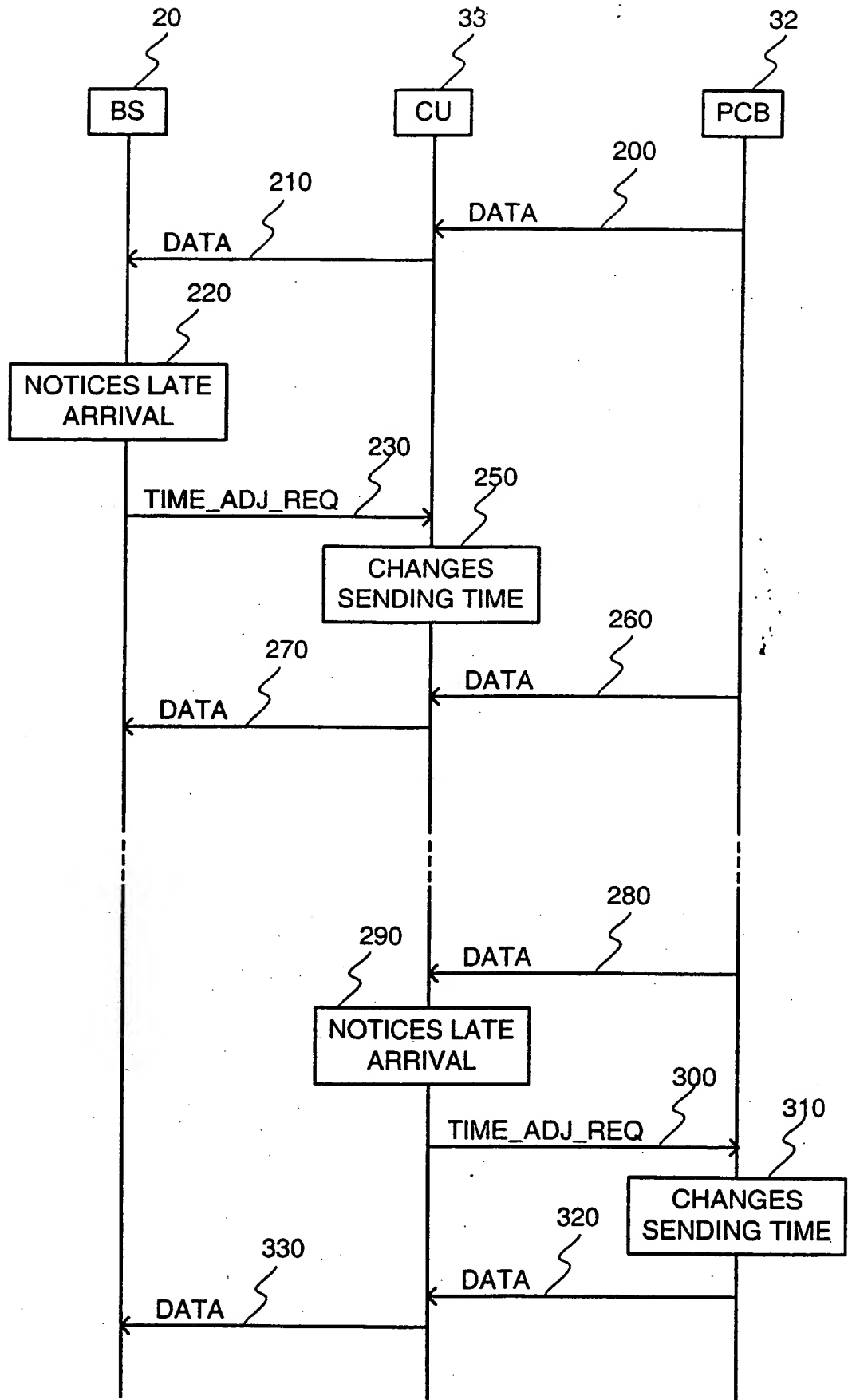


Fig. 2

3 / 3

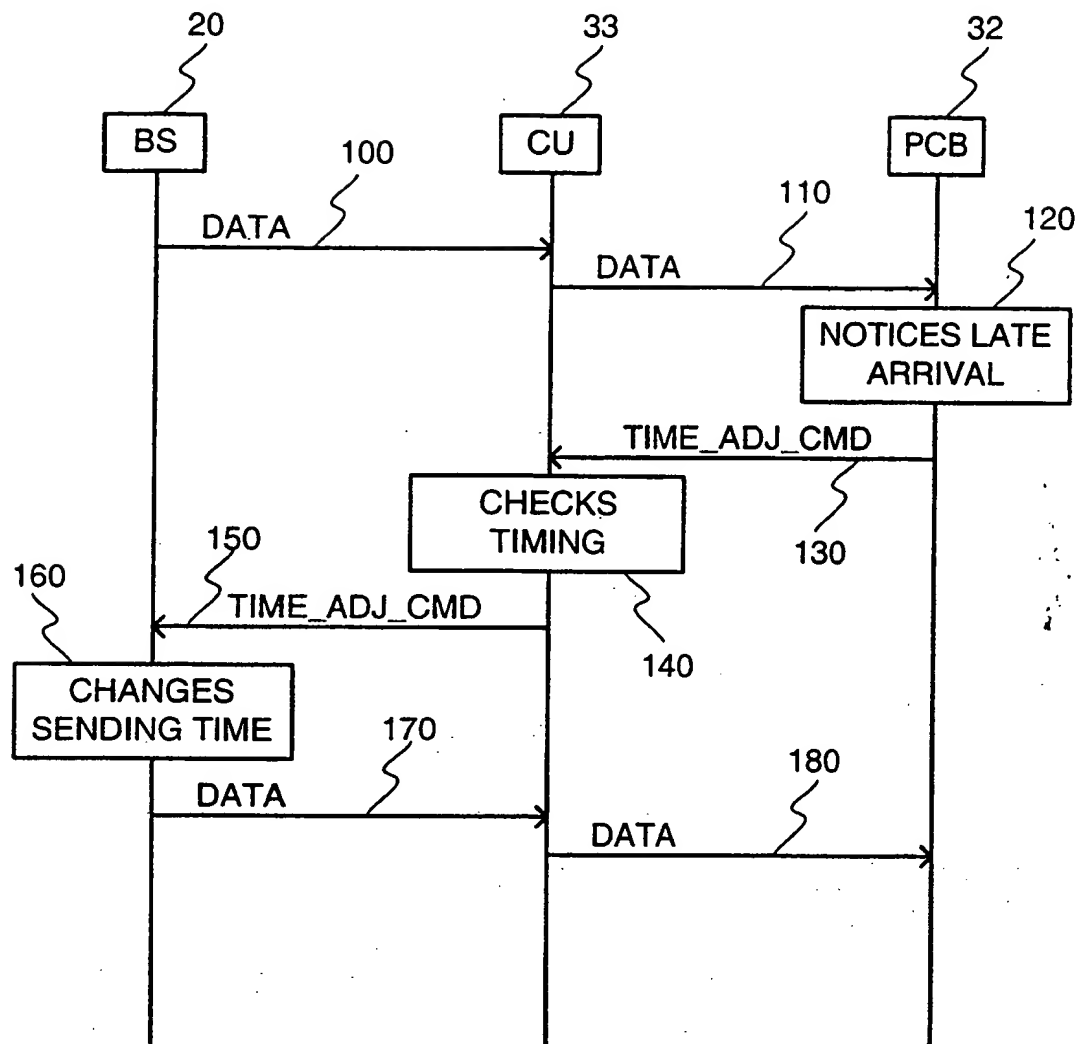


Fig. 3



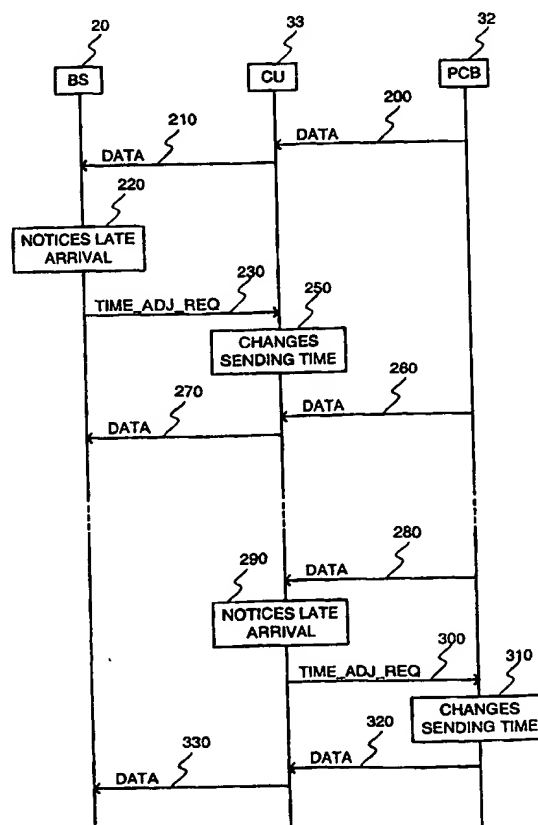
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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			(43) International Publication Date: 7 October 1999 (07.10.99)
(21) International Application Number: PCT/FI99/00269 (22) International Filing Date: 31 March 1999 (31.03.99) (30) Priority Data: 980735 31 March 1998 (31.03.98) FI (71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; P.O. Box 300, FIN-00045 Nokia Group (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): AHMAVAARA, Kalle [FI/FI]; Ruostekuja 3 D 24, FIN-01610 Vantaa (FI). KEKKI, Sami [FI/FI]; Ruusulankatu 8 A 1, FIN-00260 Helsinki (FI). (74) Agent: BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: DELAY CONTROL METHOD

(57) Abstract

The invention is directed to a method for controlling delays in a cellular telecommunications network. The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late, whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station. In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.



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EE	Estonia	LR	Liberia	SG	Singapore		

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sequenceDiagram
    participant BS
    participant CU
    participant PCB

    BS->>CU: 210 DATA
    CU->>PCB: 200 DATA
    PCB->>BS: 270 DATA
    BS->>CU: 230 TIME_ADJ_REQ
    CU->>PCB: 300 TIME_ADJ_REQ
    BS->>CU: 220 DATA
    CU->>PCB: 260 DATA
    PCB->>CU: 280 DATA
    BS->>CU: 330 DATA
    CU->>PCB: 320 DATA

    BS->>BS: NOTICES LATE ARRIVAL
    CU->>CU: CHANGES SENDING TIME
    PCB->>PCB: CHANGES SENDING TIME
    
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00269

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04B 7/005, H04Q 7/22
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04B, H04J, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9716040 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 1 May 1997 (01.05.97), page 3 - page 4; page 8, line 22 - line 27; page 9, line 6 - line 7, page 14, line 12 - line 14; page 21, line 10 - line 14; page 25, line 26 - line 30 --	1-2,5-6,9-10
Y	WO 9711568 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 27 March 1997 (27.03.97), page 4 - page 7 --	1-2,5-6,9-10
A	US 5757772 A (CARL MAGNUS THORNBERG ET AL), 26 May 1998 (26.05.98), see the whole document --	9-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search 20 October 1999	Date of mailing of the international search report 21 -10- 1999
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00269

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0795970 A2 (NEC CORPORATION), 17 Sept 1997 (17.09.97), see the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/09/99

International application No.

PCT/FI 99/00269

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9716040 A1	01/05/97	AU 707051 B AU 7355196 A EP 0857399 A	01/07/99 15/05/97 12/08/98
WO 9711568 A1	27/03/97	AU 7004796 A CA 2231281 A CN 1201584 A EP 0852100 A US 5742588 A US 5757772 A	09/04/97 27/03/97 09/12/98 08/07/98 21/04/98 26/05/98
US 5757772 A	26/05/98	AU 7355096 A EP 0857398 A WO 9716039 A AU 7004796 A CA 2231281 A CN 1201584 A EP 0852100 A US 5742588 A WO 9711568 A	15/05/97 12/08/98 01/05/97 09/04/97 27/03/97 09/12/98 08/07/98 21/04/98 27/03/97
EP 0795970 A2	17/09/97	AU 1630097 A CA 2199922 A JP 2809179 B JP 9252278 A US 5905718 A	18/09/97 14/09/97 08/10/98 22/09/97 18/05/99

13 June 2000

422 Rec'd PCT/PTO 2 1 SEP 2000

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Our Ref.: 47563/ML/MM

**REPLY TO WRITTEN OPINION
INTERNATIONAL PATENT APPLICATION NO. PCT/FI99/00269
APPLICANT: NOKIA NETWORKS OY
TERM: 23 JUNE 2000**

Dear Sirs,

Reference numbers have been added to the claims.

The expression "true spirit [...] of the invention" on the bottom of page 11 has been removed.

The applicant respectfully disagrees with the examiner about point 2 concerning item VIII, namely that the cellular telecommunications network should be part of the claimed matter. The system of claim 9 is realized within a cellular telecommunications network, it is quite nonsensical to claim a whole cellular telecommunications network to be a subcomponent of the system. The wording of the preamble of claim 9 has been adjusted slightly for clarity.

The feature "predetermined reception time" in two locations in claim 9 have been replaced by wording "predetermined time period". The original application papers provide support for this as follows. The specification mentions in numerous places the phrase "too early or too late", which implicitly defines a certain time period; since some reference time period must exist in order to be able to state that something arrives too early or too late. For explicit clarity, the concept of "outside a predefined time period" has been entered in the description on page 4 lines 16 - 17. The concept of "outside a predefined time period" is supported by the priority application as filed as well as the PCT application as filed, since the concept was present in claim 1 in both of these applications. Consequently, no new matter has been added.

In addition, the feature "predetermined reception time" in claim 10 has been replaced by wording "predetermined time period".

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VAT FI01070027

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A small error has been corrected in claim 5, line 33: "one second node" has been changed to "one first node". This change has support in numerous places in the application, the error and its correction is also evident when comparing the sentence to the corresponding sentence in claim 1.

For the sake of clarity, the word "third" has been deleted from claim 1 line 10 and claim 5 line 31. The resulting formulation is clearer than the original. Also, grammatically incorrect wording "as a said" has been changed to "as said" in claim 1 lines 10 and 11, and claim 5 lines 31 and 32.

Yours faithfully,
BERGGREN OY AB



Markus Levlin
Patent Attorney

The method for delay control adjustment in the uplink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the uplink direction. The method for delay control adjustment in the downlink direction according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a method for delay control adjustment in the downlink direction. The system according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim directed to a system. The dependent claims describe further advantageous embodiments of the invention.

The delay control method according to the invention is based on a hierarchical structure of delay controlling entities, which preferably communicate only with entities directly above or below them in the hierarchy. In the downlink direction, an entity receiving data, such as a base station or a splitting unit, sends a timing report to the entity sending the data if the data is received too early or too late (outside a predefined time period), whereafter the sending entity may adjust the sending time of data. The same reporting and adjusting process may be repeated through all levels of the control hierarchy, resulting in a collective control of delays from the top of the hierarchy, for example from a RNC, to the bottom, for example to a base station.

In the uplink direction, a higher level entity receiving data from a lower level entity may command the lower level entity to adjust the sending time, if the data is received too early or too late. When the same action is repeated in all levels of the hierarchy, a collective control of delays is achieved for the link between the lowest level, e.g. the base station, and the highest level, e.g. a RNC.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates a hierarchical network structure according to prior art,

Figure 2 illustrates an example of messaging according to an advantageous embodiment of the invention, and

combining of packets, and necessary adjustments, e.g. changing the transmission rate of a transmission link. In some embodiments of the invention, such entities may comprise one or more functional blocks, such as e.g. a block performing the combining of packets and a block performing the control of transmission links. As a
5 man skilled in the art knows, such entities can be constructed in many ways. Therefore, the description of entities as integral entities in the previous examples is intended to be only an example. Such description is used in this specification for the purposes of clarity only.

10 Although in the previous examples, the delay control method according to the invention has been described using a tree structure formed by the entities of the telecommunications network, the invention is not limited to implementation in a tree structure. The method for uplink and downlink delay control according to the invention can also be used in a chain structure.

15 In the following claims, the term node is used for the various previously described entities, such as the combining and splitting units, radio network controllers and base stations. In the following claims, the terms preceding and following are to be interpreted in view of the data flow to the specified direction. As an example, a
20 radio network controller precedes a base station in the downlink direction, since in the downlink direction, data packets pass first through a radio network controller, and only after that through a base station. Similarly, a base station precedes a radio network controller in the uplink direction, since in the uplink direction, data packets pass first through a base station, and only after that through a radio network
25 controller. Further, the term intermediate node refers to an entity in the transmission path between the protocol control block of a radio network controller and a base station. Such an intermediate node may be for example single unit or a group of units performing the duties of a splitting unit and a combining unit.

30 In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible.

Claims

1. A method for delay control adjustment in the uplink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, **characterized** in that

at least one first node sends (130) a timing adjustment command to at least one second node, if at least one uplink data packet sent by said at least one second node arrives at said at least one first node at a point in time, which point in time is outside a predefined time period, and

at least one node functions as said at least one first node in view of at least one node preceding it in the uplink direction in the network structure, and as said at least one second node in view of at least one node following it in the uplink direction in the network structure.

2. A method according to claim 1, **characterized** in that at least one of said at least one second node is a base station (20).

3. A method according to claim 1, **characterized** in that at least one of said at least one first node is a protocol control block (32) of a radio network controller.

4. A method according to claim 1, **characterized** in that at least one of said nodes is a combining unit (33).

5. A method for delay control adjustment in the downlink direction in a cellular telecommunications network comprising a plurality of functionally interconnected nodes for transmission of data, **characterized** in that

at least one second node sends (230) a timing adjustment request to at least one first node, if at least one downlink data packet sent by said at least one first node arrives at said at least one second node at a point in time, which point in time is outside a predefined time period, and

at least one node functions as said at least one second node in view of at least one node preceding it in the downlink direction in the network structure, and as said at least one first node in view of at least one node following it in the downlink direction in the network structure.

6. A method according to claim 5, **characterized** in that at least one of said at least one second node is a base station (20).

7. A method according to claim 5, **characterized** in that at least one of said at least one first node is a protocol control block (32) of a radio network controller.

8. A method according to claim 5, **characterized** in that at least one of said
5 nodes is a splitting unit (33).

9. A system in a cellular telecommunications network for controlling delays between a radio network controller and at least one base station, **characterized** in that

10 the system comprises

- a radio network controller for controlling the transfer of data,
- at least one intermediate node (33) for forwarding data in the network, which at least one intermediate node node is functionally connected to said radio network controller, and

15 - a base station (20) for sending and receiving data, which base station is functionally connected to said at least one intermediate node,
and in that,

- said radio network controller is arranged to send a timing adjustment command to at least one of said at least one intermediate node as a response to reception of at least one data packet from said at least one of said at least one intermediate node
20 after a predetermined time period,
- and said at least one intermediate node is arranged to send a timing adjustment command to said base station as a response to reception of at least one data packet from said base station after a predetermined time period.

25

10. A system according to claim 9, **characterized** in that

said base station (20) is arranged to send a timing adjustment request to at least one of said at least one intermediate node (33) as a response to reception of at least one data packet from said at least one of said at least one intermediate node after a
30 predetermined time period.

PATENT COOPERATION TREATY

PCT

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 47563	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/FI 99/00269	International filing date (day/month/year) 31 March 1999	(Earliest) Priority Date (day/month/year) 31 March 1998
Applicant Nokia Telecommunications Oy et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).

2. ☐ Unity of invention is lacking (See Box II).

3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.
☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.

4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

Figure No. 2 ☒ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00269

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04B 7/005, H04Q 7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04B, H04J, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9716040 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 1 May 1997 (01.05.97), page 3 - page 4; page 8, line 22 - line 27; page 9, line 6 - line 7, page 14, line 12 - line 14; page 21, line 10 - line 14; page 25, line 26 - line 30 --	1-2,5-6,9-10
Y	WO 9711568 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 27 March 1997 (27.03.97), page 4 - page 7 --	1-2,5-6,9-10
A	US 5757772 A (CARL MAGNUS THORNBERG ET AL), 26 May 1998 (26.05.98), see the whole document --	9-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

20 October 1999

Date of mailing of the international search report

21 -10- 1999

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00269

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0795970 A2 (NEC CORPORATION), 17 Sept 1997 (17.09.97), see the whole document -- -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/09/99

International application No.

PCT/FI 99/00269

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WO 9716040 A1	01/05/97	AU 707051 B AU 7355196 A EP 0857399 A	01/07/99 15/05/97 12/08/98
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